

## Short-Run Phillips Curve

The Phillips curve relationship was first proposed by A. W. Phillips in 1958. Following up on Phillips's research, other economists found an inverse relationship between the inflation rate and the unemployment rate. In other words, when inflation increased, the unemployment rate decreased, and when inflation decreased, the unemployment rate increased. A graphic representation of this trade-off became known as the *Phillips curve*.

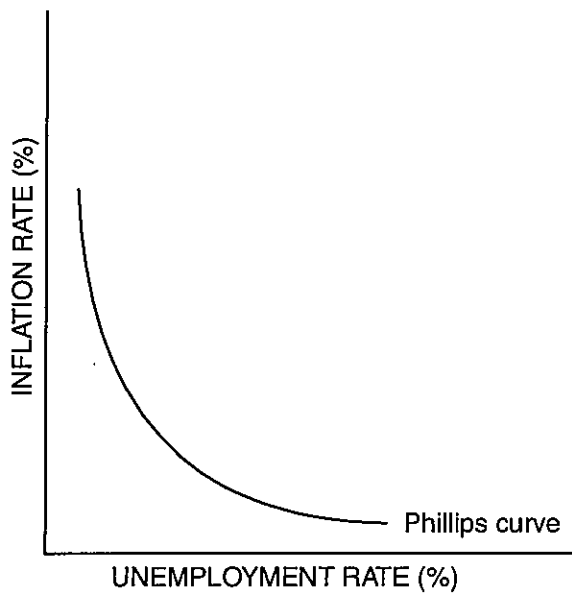


**Student Alert:** Pay close attention to the axes when you graph Phillips curves!

Figure 5-8.1 shows a Phillips curve. The curve illustrates the trade-off between inflation and unemployment.



Figure 5-8.1  
**Phillips Curve**



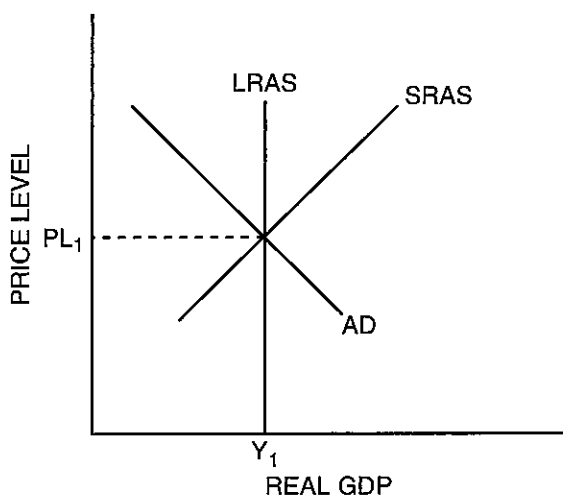
Data from the 1960s appeared to support the Phillips curve relationship. When inflation was low, the unemployment rate was high. The Phillips curve suggested that when the unemployment rate is higher than the natural rate of unemployment and the economy is not operating at its potential gross domestic product (GDP), decreasing unemployment would lead to higher inflation.

1. Assume that the economy begins in short-run equilibrium as shown in Figure 5-8.2. Graph the effect on the equilibrium price level (PL) and real GDP (Y) if there is a decrease in aggregate demand (AD). Label the equilibrium price level and real GDP after the decrease in aggregate demand as  $PL_2$  and  $Y_2$ .



Figure 5-8.2

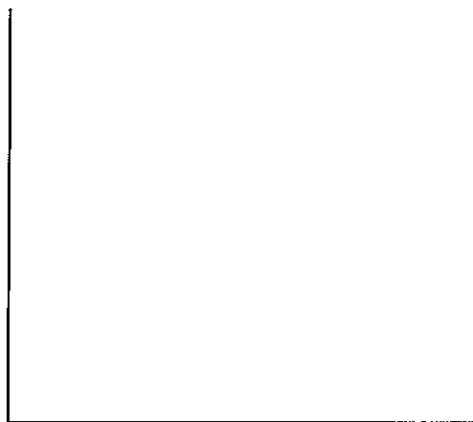
### Aggregate Demand Decrease



2. What happens to each of the following in the short run?

Real GDP \_\_\_\_\_ The unemployment rate \_\_\_\_\_  
 The price level \_\_\_\_\_ Real wages \_\_\_\_\_

3. Draw a graph of a short-run Phillips curve on the following page. Make sure you label your axes correctly. You will plot  $PL_1$  and  $PL_2$  along with their corresponding unemployment rates. There are no numbers for  $PL_1$  and  $PL_2$ , just plot  $PL_1$  at some level and then plot  $PL_2$  either above or below it, as shown in the graph above. Then select some unemployment rate ( $U_1$ ) to go with  $PL_1$  and then plot  $U_2$  either above or below  $U_1$  as shown on the graph above. Since the short-run Phillips curve shows the relationship between the inflation rate and the unemployment rate and the aggregate demand/aggregate supply (AD/AS) graph shows the relationship between the price level and real GDP, you need to determine how the change in aggregate demand affects the unemployment rate when the output level changes. Remember that when the economy is in long-run equilibrium, it is at full employment (the unemployment rate is low), and as real GDP falls, the decrease in production causes employment to decrease the unemployment rate to increase.

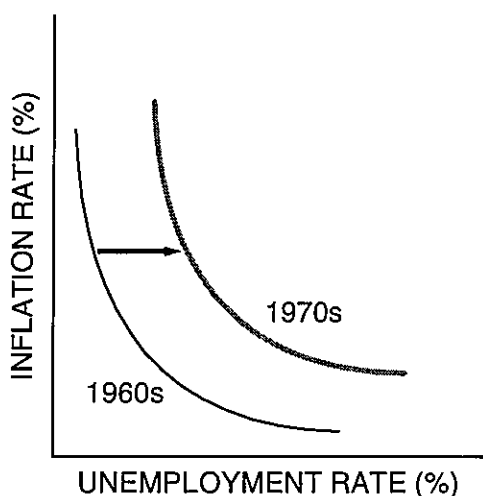


When the economy of the 1970s experienced high inflation and high unemployment at the same time (i.e., stagflation) the Phillips curve relationship no longer appeared to be true. Eventually, additional data showed that the negative relationship between the inflation rate and the unemployment rate still held, but that the short-run Phillips curve had shifted to the right, as shown in Figure 5-8.3. The rightward shift of the short-run Phillips curve was due to a negative supply shock—a decrease in aggregate supply caused by an increase in the price of oil. A positive supply shock (e.g., an advance in technology) will shift the short-run Phillips curve to the left. A negative (positive) supply shock means that for every given unemployment rate, the corresponding inflation rate is higher (lower).



Figure 5-8.3

### Short-Run Phillips Curves

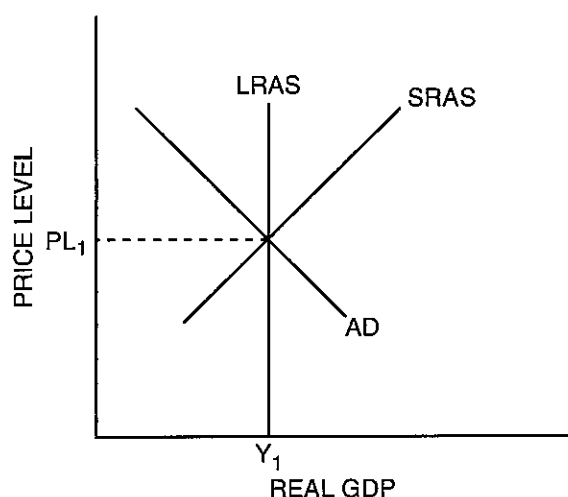


4. Assume the economy begins at long-run equilibrium as shown in Figure 5-8.4. Draw a new SRAS curve illustrating the effect of an increase in oil prices. Label the new curve  $SRAS_1$ , the new equilibrium price level  $PL_3$ , and the new level of real GDP  $Y_2$ .



Figure 5-8.4

### Effect of an Increase in Oil Prices



5. Based on your graph, what happens to each of the following in the short run?

Real GDP \_\_\_\_\_ The unemployment rate \_\_\_\_\_  
 The price level \_\_\_\_\_ Real wages \_\_\_\_\_

6. On the short-run Phillips curve you drew before, plot the inflation and unemployment rates that result when the price of oil increases. Remember that a decrease in real GDP means there has been a decrease in production, and therefore employment will fall and the unemployment rate will increase. This point lies on as SRAS curve that has shifted to the right as a result of the higher oil prices.

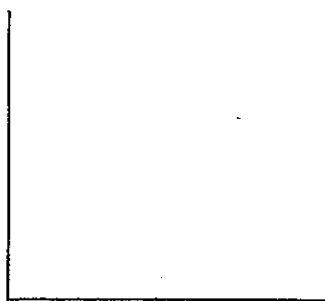
Supply shocks are not the only thing that will shift the short-run Phillips curve. The expected rate of inflation will also cause the short-run Phillips curve to shift. When workers expect inflation they bargain for higher wage rates, and employers are more willing to grant higher wage rates when they expect to sell their product for higher prices in the future. When the expected rate of inflation is higher, the short-run Phillips curve shifts to the right, and the actual rate of inflation increases. If the expected rate of inflation decreases, the short-run Phillips curve will shift to the left and the actual inflation rate will decrease. Expectations for inflation lead to change in actual inflation—like a self-fulfilling prophecy.

## *The Long-Run Phillips Curve and the Role of Expectations*

### **Expectation and the Short-Run Phillips Curve**

The short-run Phillips curve (SRPC) is drawn for a given expected rate of inflation and a specific natural rate of unemployment. Changes in inflationary expectations will shift the SRPC. People base their inflationary expectations on information and personal experience, which can result in gaps between the expected rate of inflation and the actual rate of inflation.

1. Suppose the economy is experiencing 2 percent inflation. News of rising energy costs increases people's expectations of inflation. Graph the change in the SRPC.



2. If the government increases spending, how does it affect inflationary expectations? Explain.
3. If people are confident that a new Federal Reserve policy will achieve and maintain price stability, how does it affect inflationary expectations? Explain.
4. What will happen to the actual rate of inflation if people expect a higher inflation rate in the future? What will happen to the actual rate of inflation if people expect a lower inflation rate in the future? Explain.

### The Long-Run Phillips Curve

The long-run Phillips curve (LRPC) represents the relationship between unemployment and inflation after the economy has adjusted to inflationary expectations. The LRPC corresponds to the long-run aggregate supply (LRAS) and occurs at the nonaccelerating inflation rate of unemployment (NAIRU). The NAIRU is the unemployment rate at which the unemployment rate does not change over time. The NAIRU corresponds to the full employment level of output and the natural rate of unemployment. Trying to keep the unemployment rate below the NAIRU leads to accelerating inflation rates and cannot be maintained in the long run. Unemployment rates above NAIRU will lead to accelerating deflation that cannot be maintained.

The LRPC is vertical because any unemployment rate above or below the NAIRU cannot be maintained. This means that there is no long-run trade-off between inflation and unemployment—that is, no policy can maintain unemployment rates below the NAIRU in the long run.

5. Draw a graph of the LRPC. Be sure to correctly label the axes and label the point at which the LRPC intersects the horizontal axis.



6. What does the slope of the LRPC indicate about the trade-off between the inflation rate and the unemployment rate?
7. Use the graph in problem 5 to show the effect on the LRPC if the natural rate of unemployment decreases. What happens to the LRAS when the natural rate of unemployment decreases?

## Productivity

### Economic Growth and the Determinants of Productivity

An economy's productive capacity is determined by the quantity/quality of its productive resources and technology. In the short run an economy's total productive capacity is fixed, but in the long run an economy can increase its capacity to produce goods and services by increasing the quantity and/or the quality of its productive resources or through technological progress.

An economy's productive capacity is determined by the quantity and quality of its resources, including:

- **Human resources:** labor resources and *human capital*. Human capital refers to the education and skills possessed by labor resources. Education is an investment in human capital because it increases workers' ability to produce.
- **Natural resources:** the gifts of nature that are useful in producing goods and services.
- **Capital goods:** goods (e.g., equipment and machinery) used to make other goods and services.
- **Technology:** technology refers to the way that resources are combined to produce goods and services. Technological progress means that there is a new and better way to produce. Technological progress occurs when production becomes more efficient—that is, when more output can be produced using the same inputs.

Economic growth is often measured by changes in real gross domestic product (GDP) or real GDP per capita. For example, the rate of economic growth can be measured by the average annual percentage change in real GDP per capita. Real GDP per capita is often used to measure living standards across time and between countries. Economic growth occurs because an economy experiences technical progress, increased investments in physical capital, and increased investments in human capital. In the most fundamental sense, economic growth is concerned with increasing an economy's total productive capacity at full employment.

1. What does a PPC show? What are the assumptions about resources and technology in the PPC model?

2. List two things that could happen to allow the economy to produce at Point A.

3. In Figure 6-1.1,  $Y^*$ ,  $Y_1$ , and  $Y_2$  in the aggregate supply graph correspond to which points on the PPC graph? Explain.

$Y^* \rightarrow$  Point \_\_\_\_\_

$Y_1 \rightarrow$  Point \_\_\_\_\_

$Y_2 \rightarrow$  Point \_\_\_\_\_

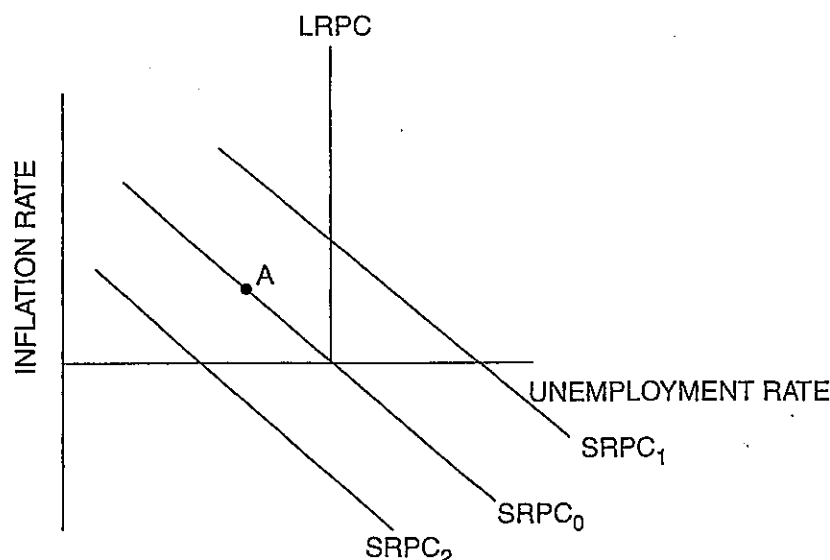
4. List two things that could happen to allow the economy to produce  $Y_2$  output.

5. How can the economy produce at  $Y_2$  in the short run? If it is producing at  $Y_2$  in the short run, what will happen in the long run? Explain.





Figure 5-9.1  
Long-Run Adjustment



8. What change in inflationary expectations is shown by the shift in the short-run Phillips curve (SRPC) from  $SRPC_0$  to  $SRPC_1$  in Figure 5-9.1?
  
9. The LRPC is vertical at the unemployment rate that corresponds to an inflation rate equal to zero. What is the name for this rate of unemployment?
  
10. At point A on the graph, the actual rate of inflation is (*greater than / less than*) the expected rate of inflation, which will cause the SRPC to shift to the (*right / left*). Label point B on the graph where the economy will be in long-run equilibrium after the change in inflationary expectations. Label point C on the graph where the economy will be if policy makers attempt to keep the unemployment rate where it was at point A after the change in inflationary expectations.

# **MACROECONOMICS**

## **Economic Growth and Productivity**

Unit 6

